UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/032,272	12/22/2001	Haoshi Song	1391-27300	6530

23505 7590 01/20/2004

CONLEY ROSE, P.C.
P. O. BOX 3267
HOUSTON, TX 77253-3267

EXAMINER	
WERNER, BRIAN P	

ART UNIT	PAPER NUMBER
2621	

DATE MAILED: 01/20/2004

13

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/032,272	SONG ET AL.	
	Examiner	Art Unit	
	Brian P. Werner	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 November 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9 and 13-45* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9,13-35 and 37-45* is/are rejected.

7)☒ Claim(s) *36* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☒ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on November 28, 2003 (Amendment C, paper no. 11) has been entered. Claims 1-9 and 13-45 remain pending.

Response to Arguments

2. Each of the remarks and/or arguments filed with the aforementioned amendment have been considered:

Claims 1, 2, 31, 36 and 38 anticipated by Newman (US 6,31,596 B1):

Applicant's arguments at pages 9-14 of the response (i.e., section "I" of the response) have been fully considered and are persuasive. The previous rejection of claims 1, 2, 31, 36 and 38 is withdrawn. Newman does not anticipate the analysis of each image separately to detect discrete anomalies of the tubing segment; as now claimed in independent claims 1 and 31, and as argued at response page 13.

Claims 1, 5-7, 9, 15, 17, 22, 23, 31-33, 37, 39 and 41 unpatentable over the combination of McCoy et al. (US 5,767,671 A) and Gorria et al. (US 5,408,104 A):

Applicant's arguments at pages 14-18 of the response (i.e., section "II" of the response) have been fully considered and are persuasive. The previous rejection of claims 1, 5-7, 9, 15, 17, 22, 23, 31-33, 37, 39 and 41 is withdrawn. Gorria does not teach analyzing the tubing by analyzing each image separately to detect discrete anomalies; as now claimed in independent claims 1, 15 and 31, and as argued at response page 16.

Claim 26 unpatentable over the combination of McCoy et al. (US 5,767,671 A) and Puffer (US 4,563,095 A)

Applicant's arguments at pages 18-19 of the response (i.e., section "II", "B" of the response) have been fully considered and are persuasive. The previous rejection of claim 26 is withdrawn. Puffer does not teach producing video signals, and then receiving and generating sequential images of the tubing surface from the video signals as now claimed in independent claim 26, and as argued at response page 19.

Dependent Claims:

Applicant's arguments at response pages 19-24 of the response (i.e., sections "II" "C-K" of the response) and directed to dependent claim. Given that the examiner has withdrawn the rejections of the independent claims from which they depend, no further response is merited.

Claims 13 and 14 unpatentable over the combination of Terry et al. (US 6,296,066 B1) and Newman (US 6,31,596 B1)

Summary of Applicant's Remarks: "Computer 210 in Newman is not a processor that receives the video signals from the imaging device. The computer 210 in Newman instead analyzes logged numerical data from data acquisition device 207."

Examiner's Response: Disagreed. The Newman reference must be taken as a whole, and not analyzed piece-meal and out of context.

First, it is clear that Newman discloses coiled tubing having a longitudinal stripe. Newman states, "a visible line is marked along the coiled tubing" at column 3, line 42.

Second, Newman discloses capturing video images of coiled tubing for purposes of detecting the stripe. Newman states, "the rotational orientation of the line, lines ... is monitored visually, with ... camera(s) and the location is logged manually or electronically" at column 3, lines 44-47.

Third, Newman's camera is designated by numeral 100, in figure 3. The camera itself is just a sensor, and does not analyze anything. The sensor data is sent from the camera to the computer. Newman states, "A sensor 100 (as described above) senses rotation of the coil tubing 202 and sends a signal indicative thereof to the device 207", and the "device 207 conveys signals ... to the computer 210" at column 6, lines 43-49. When Newman describes a "sensor 100", sensing "rotation of the coil tubing", and "as described above", Newman refers directly to the aforementioned "camera" embodiment.

Furthermore, it is the computer 210 that does all of the analysis, including determining the location of the stripe. Newman discloses a computer with modeling

software" at column 4, line 15, whereby the "computer system then uses this data [i.e., the sensor data, which in one embodiment is image data] to calculate the amount of fatigue damage and deformation for various segments along the length of the coiled tubing" at column 4, line 24. In asking the question as to "what data" Newman's computer utilizes, in the embodiment where images of the stripe are captured, the data would have to be video or image data. Certainly, Newman does not disclose any intermediate transformation of the data between the camera and the computer.

Thus, the "computer" does the calculating of fatigue damage based on the signals received from the sensor 100, which is a camera imaging a stripe. Thus, Newman discloses receiving video signals from the camera by the processor.

Regarding the argument that "computer 210 in Newman is not a processor that receives the video signals from the imaging device", the examiner disagrees as described above.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 15, 17, 18, 21 and 31 are rejected under 35 U.S.C. 102(anticipated) as being Ortiz et al. by (US 4,988,875 A).

Regarding claim 15, which is representative of claim 31, Ortz discloses:

plural imaging devices (figure 11, numerals 36; "120 degrees from each other, can provide view of the entire bulk of the cable jacket" a column 6, line 58) capturing video images ("video camera" at column 4, line 33) of coiled tubing (figure 1, numeral 20; figure 11, numeral 105 designating the same; the inspection system examines a "jacket" that is coiled as depicted in figure 1, and it a tubing because it is hollow on the inside); and

a computer analyzing each image separately extracting discrete anomalies (e.g., figure 7, numerals 75, 76 and 78) and generating an indication if an anomaly is a defect (e.g., "motion detector" at column 6, line 60 and "location of the cable area being documented" at column 7, line 40).

Regarding claim 17, the cameras are CCDs ("CCD" at column 4, line 25).

Regarding claims 18 and 21, a video stacker correlates images (figure 11, numerals 124 and 126) with a longitudinal position using a counter signal (figure 11, numeral 116; "location of the cable area being documented" at column 7, line 40).

Claim Rejections - 35 USC § 103

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

6. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Terry et al. (US 6,296,066 B1) and Newman (US 6,31,596 B1).

Newman discloses:

a coiled tubing ("coiled tubing" at column 2, line 44) having a wall (any tubing has a "wall") and an outermost layer having a longitudinal stripe ("visible line" at column 3, line 42);

an imaging device recording video signals of a segment of the coiled tubing as it is presented before the imaging device ("camera(s)" at column 3, line 45);

a processor receiving the video signals from the imaging device ("to the computer 210" at column 6, line 55); and

a program in the processor analyzing the video signals ("computer with modeling software" at column 4, line 15; and "computer system then uses this data to calculate the amount of fatigue damage and deformation for various segments along the length of the coiled tubing" at column 4, line 24) to detect the stripe on the tubing segment ("from which amount of rotation can be calculated" at column 3, line 47).

Newman does not explicitly teach a composite coiled tubing having layers of fibers forming the tubing wall.

Terry teaches a coiled tubing for deployment into a well, the tubing comprising a composite coiled tubing (figures 2 and 3) having layers of fibers form the tubing wall ("fiber" at column 10, line 32).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the tubing taught by Terry, as the tubing required by Newman, because it is "very strong" and "resistant to abrasion" (Terry, column 10, line 28), thus preventing premature wear and failure due to continuous deployment into and out of wells.

Regarding claim 14, Newman's tubing has an outer layer (all tubing has an outer layer), and Newman's outer layer has a predetermined color (as described above, Newman's tubing has a stripe, and the stripe is a predetermined color). Given that Newman analyzes the video images to detect the presence and location of the stripe, and given that the stripe is a predetermined color, then Newman naturally analyzes the video signal and detects the stripe color.

7. Claims 15, 22, 23, 31-33, 37-39 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of McCoy et al. (US 5,767,671 A) and Puffer (US 4,563,095 A).

Regarding independent claims 15, 22 and 31, McCoy discloses a system for surface inspection of a coiled tube being deployed by either injecting or removing it from a well (figure 4; "dents, wall thinning, cracks" are measured at column 5, line 33). The

details of the McCoy references as described in the previous Office Actions is incorporated herein by reference.

While McCoy is open to "any suitable type [of measurement apparatus] known in the art for taking the desired measurements" (column 5, line 36), McCoy does not teach:

a plurality of image devices configured to capture video images of the coiled tubing as the tubing passes in front of the imaging devices;

transmitting the images to a processor;

receiving the images by the processor; and

executing pattern recognition to analyze image separately;

extract discrete anomalies from each image, and

generate an indication if a discrete anomaly is identified as a defect in the image.

Puffer discloses a system for inspecting an elongated tubular body in motion (figure 1, numeral 18), comprising:

a plurality of image devices (figure 1, numerals 34, 36 and 38) configured to capture video images of the tubing (the images are video in that they are raster scanned; see "scanning raster for scanning the pixel outputs" at column 5,line 61; a plurality of images are captured in a sequence; see "each scanning frame" at column 6, line 16) as the tubing passes in front of the imaging devices (as depicted in figure 1);

transmitting the images to a processor (figure 1, numeral 44);

receiving the images by the processor (figure 1, numeral 44); and

executing pattern recognition to analyze image separately (one image is analyzed at a time; see "provide a record of pip sizes during each scanning frame" at column 6, line 16);

extract discrete anomalies from each image ("each time a pixel senses light above the threshold level" at column 6, line 1), and

generate an indication if a discrete anomaly is identified as a defect in the image (figure 2, numeral 56 and/or 58; also, where if the size does not fall within the threshold, an interrupt indicating that a defect as been located is generated; see "output 55 to an annunciator or alarm 56 ... indicative of a flaw" at column 6, line 5).

Regarding claim 23, Puffer teaches a recorder (figure 2, numeral 58).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the inspection technique of Puffer, in order to determine and detect flaws in the tubing of McCoy, in order to provide:

a "noncontact monitoring process which does not inhibit the speed" of the object (Puffer, column 1, line 41), thereby ensuring that further wear and tear of the tube is not caused by the measurement device and allowing tube deployment at regular speeds,

that can "detect different types of such irregularities ... anywhere about its periphery and along its length, and take appropriate corrective or preventative measures" (Puffer, column 1, line 35), thereby ensuring that defects can be found anywhere on the tube,

and which can prevent the indication of false defects ("falsely" at column 6, line 35) thus ensuring an accurate determination of defects.

Note: While the processor of Puffer (i.e., figure 2, numeral 44) is not explicitly disclosed as being computerized, given that the patent issued in 1986, it probably was. However, even if the process was not computerized (i.e., running on a processor under software control), it would have been obvious at the time the invention was made to one of ordinary skill in the art to program, in the McCoy and Puffer combination, the computer of McCoy (i.e., McCoy figure 4, numeral 54) to perform the analytical functions of Puffer.

8. Claims 1, 5-7, 9 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of McCoy et al. (US 5,767,671 A) and Puffer (US 4,563,095 A) as applied to claims 15 and 31 above, and further in combination with Morrison et al. (US 5,033,096 A).

Regarding claims 6 and 7, the McCoy and Puffer combination teaches detecting discrete anomalies including cracks (McCoy, "dents, wall thinning, cracks ..." at column 5, line 33).

Regarding claim, the McCoy and Puffer combination provides a warning signal (Puffer figure 2, numeral 56).

In the combination, Puffer teaches a video camera (Puffer figure 1, numerals 38 and 44) generating video signals (a sequence of images are raster scanned as

described at column 5, lines 60-68) and transferring those signals to subsequent processing for defect detection (figure 2).

The McCoy and Puffer combination does not teach an image grabber input device receiving the video signals and generating sequential images of the tubing surface from the video.

Morrison discloses a defect detection system, wherein he addresses the same problem of capturing and processing images of a moving object (figure 1, numeral 7) in the same manner that Puffer does, comprising:

an image grabber input device (figure 1, numeral 9) receiving the video signals (figure 1, numeral 8) and generating sequential images of the moving object's surface from the video ("captured signals corresponding to each frame of video signals are preferably digitized ..." at column 4, line 38).

Regarding claim 5 specifically, the frame storage of Morrison stores subsequent frames, and is thus a stacker.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the McCoy and Puffer combination, by replacing the Puffer video capture system (i.e., Puffer figure 2, numerals 38 and 45) with the video camera/frame grabber arrangement taught by Morrison (i.e., Morrison figure 1, numerals 6, 8 and 9). One skilled in the art would be motivated to make this modification for the following reasons:

The video camera and frame grabber of Morrison are commonly available, off-the-shelf items as described at section 6 of Morrison (i.e., column 7, lines 5-51), thus reducing the cost associated with specialize, custom camera and processors;

The ability to "collect the video information sufficiently quickly that the spatial resolution of the camera is not degraded, and to digitized the information into a large range of numbers representing brightness or gray levels" (Morrison, column 7, line 10), thus producing an accurate image in a short period of time; and

Because of the ability to store the images "in a dedicated area of memory" (Morrison, column 7, line 27) which offers "higher overall system speed" (Morrison, column 7, line 34), thus providing the McCoy and Puffer combination with the ability to accurately process more images to ensure that no defects on the moving tubing are missed.

NOTE: The limitations taught by Morrison, and relating to the image grabber as described above, constitute a well-known method in the art for capturing and digitizing images. Before advancing the rejection immediately above, the examiner looked to the specification and applicant's arguments to determine whether the image grabbing limitations constituted a patentable feature, by solving a problem or providing an overall benefit to the invention where coiled tubing is inspected. No advantages or benefits are described in the specification, and none were advanced in the response. Thus, it would appear that the newly added limitations are just applicant's preferred way of capturing images for defect inspection. Should the applicant feel that these features are

particularly important to the invention, and thus the features that distinguish over the over the art of record, reasons why should be presented.

9. Claims 27-30, 34, 35 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of McCoy et al. (US 5,767,671 A), Puffer (US 4,563,095 A) and Morrison et al. (US 5,033,096 A) as applied to claim 26 above, and further in combination with Kanzaka et al. (US 5,680,473 A).

Regarding claim 27, the McCoy, Puffer and Morrison combination does not receive location data indicating the position of a defect, generating the warning, and transmitting the image containing the defect and the location to the output device.

Kanzaka discloses a system for inspecting an elongated body in motion (figure 1, numeral 1; "surface inspection" at column 1,line 12), comprising receive location data indicating the position of a defect ("location thereof" at column 3, line 6), and transmitting the image containing the defect and the location to an output device ("based on a defect detection signal d ... the video signal v and the data D from the video processor unit 5 are mixed to provide a composing signal C which is delivered to a video signal recorder unit 8" at column 3, line 35).

Regarding claims 28 and 29, the output device of Kanzaka includes a monitor (figure 1, numeral 12) and a printer (figure 1, numeral 12).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to record the defect location and image each time the defect alarm is generated in the McCoy, Puffer and Morrison combination as taught by Kanzaka, in

order to provide a permanent record of both the defect location and the defect image so that an operator can view and further classify the defects to ensure "an accurate judgment to the acceptance or rejection of the defect on the inspected object" as described by Kanzaka, at column 4, lines 26-38.

Regarding claim 30, the McCoy, Puffer and Morrison combination does not teach the classifier as recognizing unwanted defects and ignoring innocuous defects.

Kanzaka discloses his classifier as recognizing unwanted defects ("X marks ... cannot be overlooked" at column 3, line 18) and ignoring innocuous defects ("O marks ... may be ignored" at column 3, line 20).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to train the classifier of the McCoy, Puffer and Morrison combination to distinguish between unwanted and innocuous defects as taught by Kanzaka, to further improve accuracy by flagging innocuous defects as such, and directing the operator's attention to more serious defects that could cause failure, and reduce the dowtime association with an operator having to review surface conditions that are not serious, and will not cause failure.

The limitations of claims 34, 35 and 40 are met by the above combinations.

10. Claims 2 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of McCoy et al. (US 5,767,671 A), Puffer (US 4,563,095 A) and Morrison et al. (US 5,033,096 A) as applied to claim 1 above, and further in combination with Newman (US 6,31,596 B1).

Claim 2:

The McCoy, Puffer and Morrison combination does not teach generating longitudinal coordinates of the tubing segment.

Newman discloses a system for imaging and detecting defects of a coiled tubing, comprising, recording the coordinates of the tubing segment ("locations" at column 3, line 45).

It would have obvious at the time the invention was made to one of ordinary skill in the art to record the locations of defects on the tubing segment of the McCoy, Puffer and Morrison combination as taught by Newman, in order to provide the operator with an indication of where the defects are for subsequent manual inspection or repair of the tubing.

Claim 8:

The McCoy, Puffer and Morrison combination does not suggest "diameter" as one of the predetermined features for measurement.

Newman, in a system for determining defects and fatigue in a deploying coiled tubing, suggests the determination of "diameter" ("diameter" at column 4, line 21 and column 1, line 58).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to include a determination of diameter as suggested by Newman, as part of the coiled tube evaluation of the McCoy, Puffer and Morrison combination, because "change in diameter" is an indicator of "deformations that can cause problems when using the coiled tubing" (Newman, column 1, line 60-62). This inclusion of a "diameter" measurement in the McCoy combination further serves to ensure an accurate determination of the tubing's condition.

11. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of McCoy et al. (US 5,767,671 A), Puffer (US 4,563,095 A), Morrison et al. (US 5,033,096 A) and Newman (US 6,31,596 B1) as applied to claim 2 above, and further in combination with Kanzaka et al. (US 5,680,473 A).

While Newman discloses determining "locations from which the amount of rotation can be calculated ... electronically" (column 3, line 46), Newman does not disclose stamping the coordinates of the tube onto the image of the tube segment.

Kanzaka discloses a system for inspecting an elongated body in motion (figure 1, numeral 1; "surface inspection" at column 1,line 12), comprising receiving location data indicating a position of a defect ("location thereof" at column 3, line 6), and stamping the coordinates of the tube onto the image of the tube segment ("composing section 6, the

video signal v and the data D ... are mixed to provide a composing signal C which is delivered to a video signal recorder" at column 3, line 37).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to mix the location coordinates and images of the McCoy, Puffer, Morrison and Newman combination as taught by Kanzaka in order to have a log of the actual images along with locations for future review and analysis of defects, and to pinpoint exactly where on the tubing defects are located for longevity analysis are repair/correction of the tubing.

12. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of McCoy et al. (US 5,767,671 A), Puffer (US 4,563,095 A) and Morrison et al. (US 5,033,096 A) as applied to claim 1 above, and further in combination with Endsley et al. (US 6,05,613 A).

The McCoy, Puffer and Morrison combination does not teach 640X480 resolution with 8 bits per color.

Endsley discloses an CCD camera comprising 640X480 resolution with 8 bits per color ("Kodak KAI-0320CM", "640 columns and 480 rows", "8-bit" at column 3, lines 26, 28 and 36).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the CCD camera taught by Endsley, as the CCD camera required by the McCoy, Puffer and Morrison combination, in order to keep the system

cost low by using a standard, commercially available and off-the-shelf camera, while providing a high quality 640X480 image to ensure an accurate inspection.

13. Claim 43 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of McCoy et al. (US 5,767,671 A), Puffer (US 4,563,095 A) and Morrison et al. (US 5,033,096 A) as applied to claim 1 above, and further in combination with Terry et al. (US 6,296,066 B1).

The McCoy, Puffer and Morrison combination does not teach the specific limitation regarding the coiled tubing as required by claims 43, including an outer wear layer; and a contrasting layer beneath the wear layer; wherein if the outer wear layer is worn away, the contrasting layer becomes visible as a contrasting feature on the tubing.

Terry discloses a coiled tubing (figure 1, numeral 20) comprising: an outer wear layer ("wear layer 36" at column 10, line 22); and a contrasting layer beneath the wear layer ("underlying load carrying layers 34" at column 10, line 27); wherein if the outer wear layer is worn away, the contrasting layer becomes visible as a contrasting feature on the tubing (the wear layer "can be of a different fiber and color making it easy to determine the wear locations" at column 10, line 33).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the coiled tubing taught by Terry, as the tubing for well deploying and monitoring require by McCoy, Puffer and Morrison, in order to make it "easy to determine the wear locations" (Terry, column 10, line 33).

14. Claims 44 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of McCoy et al. (US 5,767,671 A), Puffer (US 4,563,095 A), Morrison et al. (US 5,033,096 A) and Terry et al. (US 6,296,066 B1) as applied to claim 43 above, and further in combination with Newman (US 6,31,596 B1).

The McCoy, Puffer, Morrison and Terry combination does not teach the individually distinguishable stripes on the outer layer as required by claims 44 and 45.

Newman discloses a system for monitoring faults in a coiled tubing, where Newman teaches tubing with plural stripes ("tubing can be marked" and "series of visible lines is marked along the coiled tubing" which are marked "along its length" at column 3, lines 40-44) individually distinguishable from one another (the lines are "visible", and separate, and thus individually distinguishable). Newman analyzes the images of the stripes to determine tube rotation, and thus detects the stripes as called for by the claim.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to incorporate the stripes taught by Newman, onto the tubing of the McCoy, Puffer, Morrison and Terry combination, in order to provide the added benefit of monitoring the rotation and the locations on the tubing where defects are identified.

15. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of McCoy et al. (US 5,767,671 A) and Puffer (US 4,563,095 A) as applied to claim 15 above, and further in combination with Greenwood et al. (US 3,770,111 A).

While the McCoy and Puffer combination requires image capture devices around the periphery of the tubing, McCoy and Puffer do not teach the use of fiber optic image devices.

Greenwood discloses an optical inspection system wherein Greenwood teaches the use of fiber optic imaging devices ("fiber light guides" at column 3, line 58).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the fiber optic image devices of Greenwood, in order to capture the images required by the McCoy and Puffer combination, in order to "gather light over a much larger portion" of the tubing (Greenwood, column 4, line 1) with "a considerable decrease in optical complexity" (Greenwood, column 4, line 4), thereby providing an accurate and detailed image using a less complex, less prone to failure and lower cost image system.

16. Claims 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of McCoy et al. (US 5,767,671 A) and Puffer (US 4,563,095 A) as applied to claim 15 above, and further in combination with Chiu et al. (US 6,031,931 A).

The McCoy and Puffer combination inspects and records defects along a length of tubing while in motion.

Regarding each of the claims, McCoy and Puffer does not teach a counter identifying a location along the tubing, where the computer reads the counter to identify the location at which a defect is found.

Regarding claims 19 and 20 specifically, McCoy and Puffer do not teach disabling or enabling the inspection system based on sensor speed.

Chiu discloses a system for inspecting an elongated body in motion (figure 3), comprising a counter ("cycle detector" and "encoder" at column 6, line 5) receiving location data indicating a position of a defect ("position" at column 6, line 28) and disabling or enabling the inspection system based on sensor speed ("beginning of a cycle" at column 6, line 6; "synchronize camera operation with movement" at column 6, line 37).

It would have been obvious at the time the invention was made to one of ordinary skill in the art provide the encoder and distance information taught by Chiu, to the computer of the McCoy and Puffer combination, in order to detect the "beginning" of inspection (Chiu, column 6, line 6) when the tube starts to move, to "synchronize camera operation with" the tube's movement (Chiu, column 6, line 37), and to precisely note the location of the defect so that it can be further examined by an operator and/or repaired, and to provide data for the ultimate determination of the tube's life and possible failure modes.

17. Claims 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of McCoy et al. (US 5,767,671 A) and Puffer (US 4,563,095 A) as applied to claim 15 above, and further in combination with Newman (US 6,31,596 B1).

Claim 24:

The McCoy and Puffer does not teach the individually distinguishable stripes on the outer layer as required by claims 44 and 45.

Newman discloses a system for monitoring faults in a coiled tubing, where Newman teaches tubing with plural stripes ("tubing can be marked" and "series of visible lines is marked along the coiled tubing" which are marked "along its length" at column 3, lines 40-44) individually distinguishable from one another (the lines are "visible", and separate, and thus individually distinguishable). Newman analyzes the images of the stripes to determine tube rotation, and thus detects the stripes as called for by the claim.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to incorporate the stripes taught by Newman, onto the tubing of the McCoy and Puffer combination, in order to provide the added benefit of monitoring the rotation and the locations on the tubing where defects are identified.

Claim 25:

The McCoy and Puffer combination does not suggest "diameter" as one of the predetermined features for measurement.

Newman, in a system for determining defects and fatigue in a deploying coiled tubing, suggests the determination of "diameter" ("diameter" at column 4, line 21 and column 1, line 58).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to include a determination of diameter as suggested by Newman, as part

of the coiled tube evaluation of the McCoy and Puffer combination, because "change in diameter" is an indicator of "deformations that can cause problems when using the coiled tubing" (Newman, column 1, line 60-62). This inclusion of a "diameter" measurement in the McCoy and Puffer combination further serves to ensure an accurate determination of the tubing's condition.

18. Claims 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of McCoy et al. (US 5,767,671 A) and Puffer (US 4,563,095 A) as applied to claim 31 above, and further in combination with Husseiny (US 5,210,704 A).

The McCoy and Puffer combination does not teach identifying an anomaly as a defect by determining if a defect size has grown beyond a percentage of its original size.

Husseiny discloses a system in the field of defect inspection and failure analysis, comprising identifying a feature as a defect by determining if a defect size has grown beyond a percentage of its original size (figure 17).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to monitor defect growth on the coiled tubing of the McCoy and Puffer combination, and thereby identifying defects when a threshold has been reached as taught by Husseiny, in order to identify "incipient failures ... during operation" and provide an indication to the operation of the tube's "expected life" along with "a warning for the remaining time until failure of the equipment" (Husseiny, column 4, lines 40-54),

thereby providing the operator with the ability to predict a failure before it actually occurs in order to take appropriate action and avoid costly losses during an operation.

Allowable Subject Matter

19. Claim 36 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The features of claim 36, in combination with claim 31 from which it depends, that are not suggested by the prior art are as follows: Specifying the "annular location" of an anomaly, with respect to an "annular" reference established by a "longitudinal stripe" located on the "outer diameter" of the tubing, and indicating the "annular" position of the anomaly. The Ortiz reference has an annular stripe as depicted in figure 7, at numeral 74, but that stripe is located on the "inner" surface of the tubing.

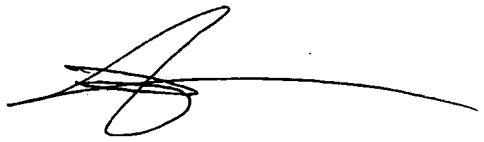
Conclusion

20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian P. Werner whose telephone number is 703-306-3037. The examiner can normally be reached on M-F, 8:00 - 4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo H. Boudreau can be reached on 703-305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-4750.

Brian Werner
Primary Examiner
Art Unit 2621
January 9, 2004



BRIAN WERNER
PRIMARY EXAMINER